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OFF-SITE SURVEILLANCE ACTIVITIES OF THE SOUTHWESTERN RADIOLOGICAL HEALTH LABORATORY
from July through December 1964

by
Southwestern Radiological Health Laboratory

Department of Health, Education, and Welfare
Public Health Service
National Center for Radiological Health

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ABSTRACT

The Southwestern Radiological Health Laboratory of the Public Health Service performed off-site radiological surveillance for fifteen announced underground nuclear detonations and four reactor experiments during the period from July through December 1964, at the Nevada Test Site. This surveillance is conducted in the public areas surrounding the Nevada Test Site under a Memorandum of Understanding with the U. S. Atomic Energy Commission. Off-site radiological surveillance was also provided for an underground test conducted in Mississippi as part of the Vela Uniform program.

During the six-month period, two announced nuclear events and four reactor experiments released radioactivity which was detected off-site. No radioactivity was released following the Project Salmon detonation in Mississippi.

Analysis of all sampling and surveillance performed during the six-month period indicates that the safety criteria established by the Atomic Energy Commission for the off-site population were not exceeded.

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I. INTRODUCTION

During the period July through December 1964, fifteen announced underground nuclear tests were conducted by the U. S. Atomic Energy Commission at their Nevada Test Site as a part of Operation Whetstone. In addition, four reactor experiments were conducted on the Nuclear Rocket Development Station. Also, the Salmon Event of Project Dribble was conducted underground in Mississippi. The Public Health Service carried out a program of radiological surveillance of the public areas off-site for the Operational Safety Division of the AEC's Nevada Operations Office under a Memorandum of Understanding between the U. S. Atomic Energy Commission(AEC) and the Public Health Service(PHS).

The Off-Site Radiological Safety Program of the Southwestern Radiological Health Laboratory(SWRHL) conducted its program of radiological monitoring and environmental sampling in the off-site areas surrounding the restricted area enclosed within the Nevada Test Site and the Nellis Air Force Range. This over-all complex of the Nevada Test Site(NTS) and the Nellis Air Force Range(NAFR) includes the Nuclear Rocket Development Station(NRDS) and the Tonopah Test Range(TTR) and for simplicity will be called the test range complex throughout this report. Although routine sampling and monitoring was done within a 300-mile radius around the test range complex, surveillance was extended as necessary to provide adequate coverage.

This report describes the methods and equipment used and summarizes the data collected during the six-month period.

II. OPERATIONAL PROCEDURES

A. Ground monitoring

Mobile monitoring teams were deployed in the off-site area before each event to locations most likely to be affected by a release of radioactive material. If a release did occur, the teams conducted a ground monitoring program directed from Control Point headquarters via two-way radio communications. Ground monitoring continued until activity levels became too low to necessitate further monitoring.

Each monitor was equipped with an Eberline E-500B, a Precision Model 111 Standard "Scintillator", a Beckman MX-5, and a Tracerlab AN/PDR T1B. The Eberline E-500E has a range of 0 to 200 milliroentgens per hour (mR/hr) gamma and beta-gamma detection in four scales with an external halogen filled GM tube and a 0 to 2000 mR/hr range from an internal Anton 302 tube. The Precision Model 111 Standard "Scintillator" was used primarily for low level detection since it provides a range of 0 to 5 mR/hr in six scales. The Beckman MX-5 instrument has a range of 0 to 20 mR/hr in three scales. It is equipped with an external Geiger tube with a sliding beta shield. The Tracerlab AN/PDR T1B has a range of 0.05 to 50,000 mR/hr in five scales. This instrument employs an air ionization chamber detector. These instruments are accurate to ±20%, and readings can be taken to two significant figures.

B. Exposure rate recorders

To supplement the ground monitoring program, Eberline RM-11 exposure rate recorders were utilized to document cloud passages at fixed locations, thereby allowing mobile monitoring teams to continue following the release as it moved through the off-site area. These recorders utilize a Geiger tube detector and operate on 110 V AC. They have a 0.01 to 100 mR/hr range and are accurate to ±20%. Gamma dose rate is recorded on a 30-hour strip chart.

C. Aerial cloud tracking

A PHS aerial monitoring team was available for each experiment. In the event of a radioactive release, this team, equipped with instruments identical to those used by ground monitors, tracked the effluent. Normally an Air Force U3-A aircraft and a PHS Aero-Commander were used in this tracking mission.

Aerial cloud tracking is essentially used to detect relative radiation intensities and to indicate cloud position, speed and direction. The information thus obtained is utilized to position ground monitors to insure comprehensive ground coverage and subsequently better surveillance.

D. Aerial sampling

The aerial sampling program was performed by the Engineering Development Program of the Southwestern Radiological Health Laboratory. The program used two C-45 aircraft for cloud sampling activities. Cloud samples were collected by cryogenic, electrostatic precipitator, and mass air sampling techniques. The methods developed have resulted in measurements of cloud inventories which have been reasonably consistent with determinations made by other organizations and other methods.

E. Air sampling

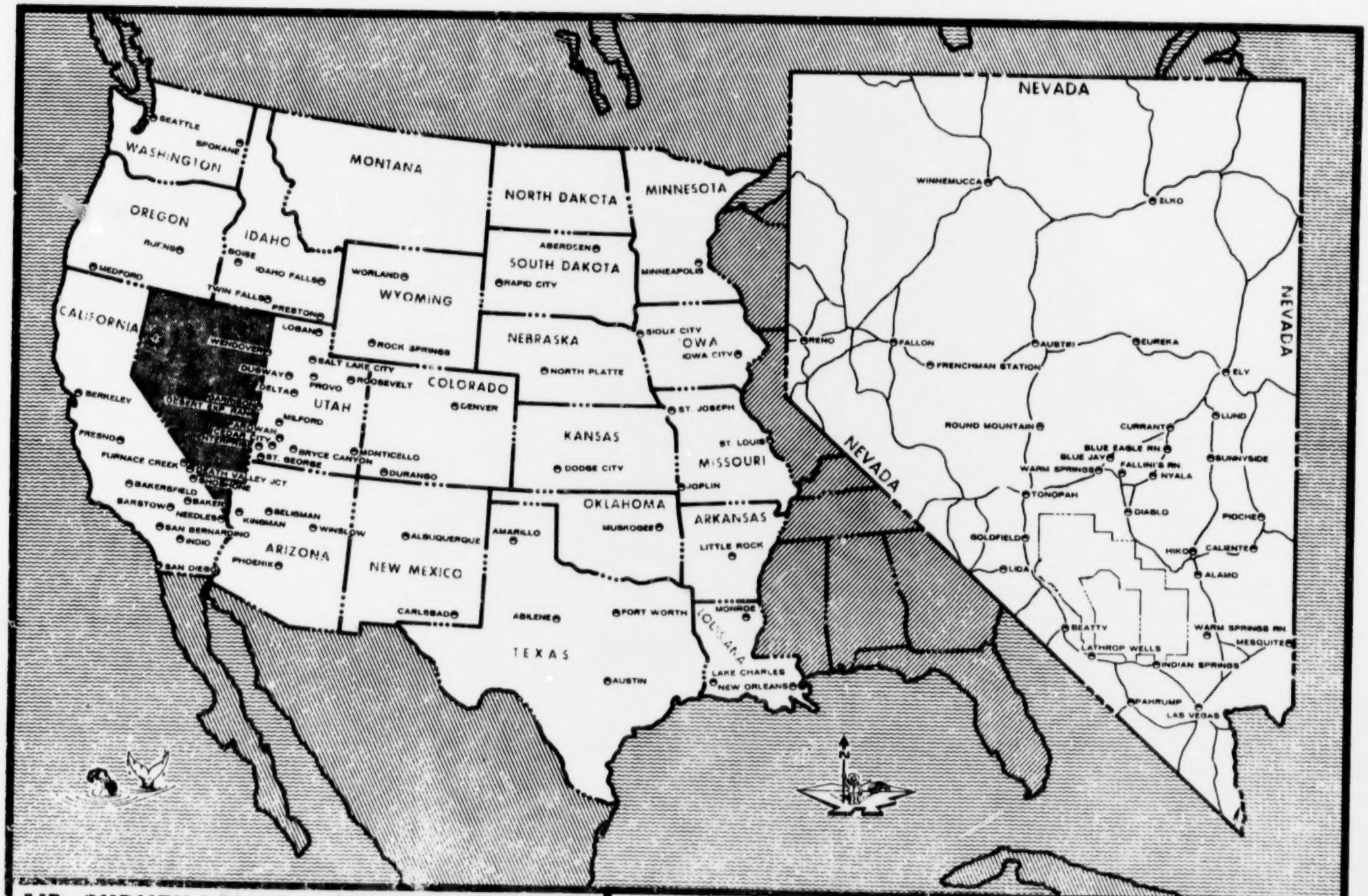
At the beginning of this six-month period the PHS was using Staplex Air Samplers. This air sampler was a high volume, turbine-type impeller powered by an electric motor. The sampler was equipped with a special sampling head designed to accommodate a Gelman type E, 8- by 10-inch glass fiber filter and an MSA* activated charcoal cartridge. By December 1964 all Staplex Samplers were replaced by Gelman "Tempest" Air Samplers. The "Tempest" Air Sampler employs a Gast Model 1550 vacuum pump driven by a General Electric 1/2 horsepower motor. The pump runs at 1440 rpm with an average flow rate of approximately 10 cfm. The sampler is equipped to use a 4-inch diameter Whatman 541 filter paper and an MSA charcoal cartridge. The total volume of air sampled is calculated from an average vacuum reading (which in turn indicates the average flow rate) and the total time of sampling. The network of air sampling stations is shown in Figure 1.

F. Milk and water sampling

The previously established milk sampling program from both commercial dairies and private producers continued throughout the six-month period. Forty-two sources were routinely sampled during this period, most on a monthly basis. A total of 201 samples was collected from these locations. In the event of cloud passage over a specific area, intensified sampling within the area was conducted to document changes in activity.

Water samples were collected on a routine basis, unless circumstances dictated specific source sampling. Both potable and nonpotable water supplies were sampled. During this period 136 water samples were collected from 27 sources. Most of these sources are sampled on a monthly basis.

*Mine Safety Appliance Co.



AIR SURVEILLANCE NETWORK STATIONS

FIGURE 1

U S DEPARTMENT OF HEALTH EDUCATION AND WELFARE
PUBLIC HEALTH SERVICE

SOUTHWESTERN RADIOLOGICAL HEALTH LABORATORY
National Center for Radiological Health
LAS VEGAS NEVADA

G. Vegetation sampling

Normally, vegetation samples were collected only in the event of a release of radioactive material. The analytical results of these samples were used to delineate the fallout pattern.

H. Film badges

Approximately two hundred residents in the off-site area wore film badge dosimeters throughout this period. These film badges were changed each month and were processed by the Radiological Safety Department of Reynolds Electrical and Engineering Company, Inc. Approximately seventy-five station badges were also utilized to provide more complete coverage. The badge used is made up of Du Pont type 555 film. Dose, as determined from this film, is accurate to ±50% in the 30 to 100 mR range and ±10% in the 100 to 2000 mR range.

I. Public relations

Frequent contacts with the off-site population, schools and civic groups provided the opportunity to explain the role of the Public Health Service with respect to the programs of the Atomic Energy Commission. As a result of favorable public relations, a number of off-site residents took part in the environmental sampling program; all routine sampling stations except Las Vegas were operated by local citizens, and many people volunteered to wear film badge dosimeters.

J. Medical and veterinarian services

A Public Health Service Medical Officer was available on short notice in the event any cases of a medical nature arose as a result of the test series. No such cases were brought to the attention of the PHS.

An Army Veterinarian assigned to the NVOO, AEC, was available to the Public Health Service Off-Site Radiological Safety Program. Veterinarian services were also provided by a PHS Veterinarian. Liaison was maintained with livestock producers in the area and the program of wildlife and cattle investigation was continued. Semi-annual slaughter of cattle from the NTS herd and the Knoll Creek and Delamar Valley herds was accomplished in cooperation with the University of Nevada. Specimens from these animals were analyzed for radionuclide content.

K. Bioenvironmental research

Another program of the Southwestern Radiological Health Laboratory is bioenvironmental research. The mission of this program is, in part, to investigate the inter-relationships among the levels of radionuclide contamination of air, soil, water, vegetation and milk.

III. ANALYTICAL PROCEDURES

All air sample prefilters and charcoal cartridges were returned to the Southwestern Radiological Health Laboratory in Las Vegas for radiological analyses. All 8- by 10-inch glass fiber filters were counted for gross beta activity in a thin window, large area proportional probe connected to a high speed scaler. This system has an efficiency of approximately 30% for 1.5 Mev betas and background for the system is approximately 600 cpm. The 4-inch prefilters were counted for gross beta activity in a Beckman "Wide Beta" low background(6 ± 1 cpm beta) proportional system which has an efficiency of approximately 45% for 0.54 Mev betas. After an initial count, if no significant activity was detected, the prefilters were counted at 5 and 12 days after collection. In all other cases, prefilters were recounted a minimum of three times in the first 48 hours following collection. The computational procedure employed depends upon the assumption that a decay constant can be determined for each individual sample and that this constant can then be used to extrapolate the activity to the end of the collection period.

Each prefilter selected and all charcoal cartridges were analyzed for gamma isotopes by placing them directly on a 4- by 4-inch NaI(Tl) crystal coupled to a TMC*Model 404C gamma pulse height analyzer viewing energies from 0 to 2 Mev.

Detection capability of the system as shown in Table 1 is an empirical estimate obtained from previous data collected under the following conditions:

a. Count time in days after fissioning as indicated by footnotes.
b. Prefilters collect unfractionated fission products resulting in a complex spectrum.
c. MSA charcoal collects gaseous fission products only (primarily iodines).

*Technical Measurements Corporation

d. An eight isotope matrix is employed for computation and isotopes other than those examined are present in amounts which are small relative to those eight.

e. Natural activity on air samples is approximately five times system background.

Table 1. Threshold detectability of radionuclides in various samples (90% confidence level).

Sample Type	Detectability at time of count						
	^{131}I	^{132}Te-I	^{133}I	^{135}I	^{140}Ba-La	Length of count	Notes
Whatman No. 541	500	1000	500	1000	500	10 min	1
(pCi)	200	-	200	-	200	10 min	2
MSA Charcoal	200	400	200	400	200	10 min	1
(pCi)	100	-	100	-	100	10 min	2
3.5 liter water* (pCi/l)	20	40-50	20-30	40-50	20	40 min	4
3.5 liter milk* (pCi/l)	20		20-30		20	40 min	3

*Counted in 3.5 liter inverted well(Marinelli) aluminum beakers.
1 - counted at less than 3 days after formation.
2 - counted at 3 days or more after formation.
3 - with $^{137}Cs \leq 100$ pCi.
4 - assuming insignificant amounts of other nuclides, and all given isotopes at about detection limits to approximately 10 times the lower limit.

Although the minimum detectable levels for water samples involve the limitations listed in (d) and (e) above, the situation is usually simplified by having no background other than that of the system. For a sample containing all of the isotopes of iodine, the error term on threshold values at the 95% confidence level is approximately equal to $\pm 50\%$.

Biological discrimination will limit the number of isotopes present in a milk sample to relatively few. Under normal sampling procedures, this discrimination coupled with the short physical half

life will tend to eliminate ^{132}I and ^{135}I from the sample by the time it is counted. At the 95% confidence level reported values for milk are ± 10 pCi/l or 10% at the time of count whichever is greater for a 40 minute count.

After any release of activity from the NTS, milk samples are collected from dairies (processing plants), producing dairy farms, and farms producing milk for their own consumption. Each sample is counted for 50 minutes. No attempt is made to recount samples giving low positive values. The lower limit of detection for gamma emitters in milk samples is 20 picocuries per liter (pCi/l) at the time of count, and all results below that value are reported as not detectable.

All liquid samples are counted in 3.5 liter inverted well aluminum beakers which are placed on top of a 4- by 4-inch NaI crystal coupled to a 400-channel gamma pulse height analyzer. Overall detection efficiency for the 0.364 Mev photopeak of ^{131}I is 6.4%. A matrix technique is employed to compute the interference due to the presence of other isotopes. The input to this matrix is variable, allowing for the simultaneous determination of any eight nuclides for which detection efficiencies and interference factors have been obtained. Actual computation is performed by an IBM 1620 computer.

Water samples are analyzed for gross beta activity by slowly evaporating an aliquot to dryness in a 2-inch diameter stainless steel planchet and counting the beta activity in a low background counter.

IV. RESULTS

A. Underground tests

Two of the fifteen detonations at the Nevada Test Site resulted in releases of radioactive effluent which was detected in off-site populated areas. These were the Parrot Event, conducted on December 16, 1964 and the Sulky Event, a Plowshare experiment conducted on December 18, 1964. As mentioned previously, the Salmon Event, conducted in Mississippi on October 22, 1964, did not result in a release of radioactivity.

1. Parrot

The Parrot Event resulted in a small release of radioactivity which light winds carried to the north of the test site. Subsequent nighttime drainage winds carried the remaining effluent to the south.

The only locations at which ground monitors detected levels of radioactivity above background were in an unpopulated area along Highway 25. The peak exposure rate was measured at 1600 hours 6.3 miles northwest of Coyote Summit. The time interval in which exposure rates greater than background existed was from 1600 to 1630 hours. The net peak exposure rate measured was 0.14 mR/hr.

Two air samples collected off-site on the two days following the Parrot Event contained fresh fission products. Several other samples collected showed gross beta concentrations above normal background. The results of the analyses of these samples are shown in Table 2.

Table 2. Analyses of air samples following the Parrot Event.

Location	Air Volume (m^3)	Date - Time On	Date - Time Off	Collector	Gross Beta Count Activity (pCi/m^3)	Gamma Pulse Height Analysis Activity (pCi/m^3)		
						^{131}I	^{133}I	^{135}I
12 miles NW of Hancock Summit*	7	12/16-1523	12/16-1540	P	74	ND	ND	ND
				C		ND	ND	ND
Hiko Junction, Nevada*	46	12/16-1748	12/16-1948	P	60	ND	ND	ND
				C		ND	ND	ND
Indian Springs, Nevada	378	12/16-0835	12/17-0645	P	.47	ND	ND	ND
				C		ND	6.6	ND
Mesquite, Nevada	364	12/16-1000	12/17-0500	P	22	ND	ND	ND
				C		ND	ND	ND
Panaca, Nevada	246	12/16-1330	12/17-1025	P	23	ND	ND	ND
				C		ND	ND	ND
St. George, Utah	243	12/16-1810	12/17-0835	P	36	ND	ND	ND
				C		ND	ND	ND
Warm Springs Ranch, Nevada	399	12/16-0800	12/17-0610	P	8.5	NOT ANALYZED		
				C		0.6	0.6	ND

*Unpopulated locations
P - Prefilter
C - Charcoal cartridge
ND - Not detectable

Note: This table includes only those air samples containing fresh fission products or gross beta concentrations above normal background fluctuations. Results are corrected to the end of the collection period.

Milk, water and vegetation samples collected following this event did not show the presence of fresh fission products when analyzed.

2. Sulky

Project Sulky was conducted at the Nevada Test Site on December 18, 1964, at 1135 hours. The test was a Plowshare cratering experiment.

The only indications of radioactivity off the test range complex were gamma exposure rate measurements taken by ground monitors and RM-11 exposure rate recorders. The maximum gamma exposure rate measured by recorder instruments was 0.06 mR/hr at Nyala, Nevada during the period 1505 to 1800 hours on December 18. The maximum external exposure at any monitored station, including Nyala, did not exceed 0.1 mR.

The environmental samples (milk, water and vegetation) collected following Sulky contained no fresh fission products.

B. Reactor experiments

1. Kiwi B4E

On August 28 and September 10, 1964, the Kiwi B4E reactor was tested at Test Cell C, located at the Nuclear Rocket Development Station, Jackass Flats, Nevada. Each test was conducted at design power and the reactor was operated in an upright position so that the hydrogen coolant exhausted upward along with escaping fission products.

a. Kiwi B4E EPV, August 28, 1964

On August 28, the Kiwi B4E reactor was tested under the conditions known as Experimental Plan V (EPV). The reactor was operated at design power from 1239 to 1247 hours

PDT. Low levels of radioactivity were detected off the test range complex. The only locations at which ground monitors detected exposure rates above background were Coyote Summit (0.17 mR/hr) and Goss' Ranch (0.18 mR/hr); Coyote Summit is uninhabited and Goss' Ranch had a population of two adults and three children during the surveillance period.

Several air samples obtained on the test day contained fresh fission products. The results of analyses of the prefilters and charcoal cartridges are presented in Table 3.

Table 3. Analyses of air samples following the Kiwi B4E EP-V.

Location	Time-Date On Hrs PDT	Time-Date Off Hrs PDT	Volume (m^3)	Prefilter Gross Beta (pCi/m^3)		Gamma Pulse Ht. Analysis (pCi/m^3) ^{131}I	^{132}I	^{133}I	^{135}I
Goss' Ranch	1400, 8/28	1600, 8/28	85	22.0	P	3	10	42	<1
					C	10	1000	100	500
Pioche	1840, 8/28	1200, 8/29	707	<1	P	ND	ND	<1	ND
					C	ND	ND	<1	ND
Hiko	1445, 8/28	0900, 8/29	776	<1	P	ND	ND	<1	ND
					C	ND	ND	<1	ND
Blue Jay Maint. Stn.	0700, 8/28	0700, 8/29			C	<1	ND	ND	ND

P - Prefilter
C - Charcoal cartridge
ND - Not detectable

Note: This table includes only those air samples containing fresh fission products. Results are corrected to the end of collection.

Air samples taken on August 28 at Alamo, Sunnyside, Currant, Lund, and Ely, Nevada and Garrison, Utah, did not contain fresh fission products when analyzed.

A milk sample obtained on August 30 from Donahue's Ranch, located 25 miles north of Ursine, Nevada, indicated the presence of ^{131}I at a level of 20 pCi/l - the threshold of detectability for this isotope. Milk samples obtained from 21 other ranches and four producer dairies did not contain fresh fission products in detectable quantities. (See Appendix).

A nonpotable water sample taken from a pond at Fillmore, Utah on August 31 indicated 20 pCi/l of ^{131}I. Six additional samples from other locations in Nevada and Utah did not contain fresh fission products when analyzed.

b. Kiwi B4E EP-VI, September 10, 1964

The Kiwi B4E reactor was tested under the conditions known as Experimental Plan VI (EP-VI) on September 10, 1964 with the reactor tested in an upright position. The test was a nominal two-minute run at design power and commenced at 1155 PDT. Gamma exposure rates above background were not detected off the test range complex with portable monitoring instruments, although monitors were in the path of the cloud as determined by aerial monitoring and environmental sampling.

Three air samples collected on the test day contained fresh fission products and the results are presented in Table 4. Other air samples taken on September 10 at Pioche, Alamo, Ely, Sunnyside, and Currant, Nevada, and Garrison, Utah did not contain detectable quantities of fresh fission products.

Only milk samples from Schofield Dairy Farm at Hiko, Nevada indicated fresh fission products in detectable quantities. A sample collected on September 12 contained 30 pCi/l

of ^{131}I and a sample collected the following day contained 40 pCi/l of ^{131}I. Results of analysis of all milk samples collected are shown in the Appendix.

Table 4. Analyses of air samples following the Kiwi B4E EP-VI.

Location	Time-Date On Hrs PDT	Time-Date Off Hrs PDT	Volume (m^3)	Prefilter Gross Beta (pCi/m^3)		Gamma Pulse Ht. Analysis(pCi/m^3) ^{131}I	^{132}I	^{133}I	^{135}I
Goss' Ranch	1500,9-10	1745,9-10	119	445	P	7.0	ND	3.0	28
					C	0.8	ND	3.0	ND
Hiko	0810,9-10	0815,9-11	900	19	P	0.3	ND	2.0	ND
					C	0.2	ND	0.5	ND
Caliente	0920,9-10	0800,9-11	963	<1	P	0.1	1.5	1.0	ND
					C	ND	ND	ND	ND

P - Prefilter
C - Charcoal cartridge
ND - Not detectable

Note: This table includes only those air samples containing fresh fission products. Results are corrected to the end of collection.

2. NRX-A2

On September 24 and October 15, 1964, the NRX-A2 reactor experiments were conducted at Test Cell A at the Nuclear Rocket Development Station.

a. NRX-A2 EPIV, September 24, 1964

On September 24, the reactor was tested under the conditions known as Experimental Plan IV (EPIV) and was operated at design power from 1055 to 1105 PDT. The reactor was tested in an upright position so that the hydrogen coolant exhausted upward along with escaping fission products.

Gamma exposure rates above background were detected in the vicinity of Lathrop Wells, on Highway 95, and at Dansby's Ranch located 10 miles southwest of Lathrop Wells. (See Table 5) Lathrop Wells has a population of about fifty people.

Monitoring at these places on the day following the test produced only background readings. Monitors were also called upon to check the off-site area during the night following the test when activity was detected on the NRDS. Readings above background were found off the test range complex for five miles along Highway 95 starting nine miles northwest of Lathrop Wells. The maximum reading of 0.12 mR/hr was found 9.8 miles NW of Lathrop Wells at approximately 0100 hours on September 25.

Table 5. Exposure rates occurring off the test range complex on September 24, 1964.

Location	Time of Peak *Exp. Rate (PDT)	Time of Exp.* Rates greater than Background	Net Peak Exp* Rate (mR/hr)
Lathrop Wells	1234	1215-1500	0.43
Dansby's Ranch	1320	1250-1450	0.07
Hwy. 95 (4.5 mi. NW of Lathrop Wells)	1220	1240-1330	0.23

*Exp. = exposure

Several air samples taken following the test contained fresh fission products. The results of analysis of the prefilters and charcoal cartridges are presented in Table 6. Air samples taken on September 24 at Scotty's Castle, Beatty and Springdale showed no fresh fission products when analyzed.

Milk samples obtained on the test day and the two following days at Dansby's Ranch indicated low levels of ^{133}I. Iodine-131 was not present in detectable quantities. Six other milk samples collected did not contain fresh fission products in detectable quantities. (See Appendix)

Water samples collected on the day of the test at Dansby's Ranch and the day after the test at the Watson and Selbach Ranches near Lathrop Wells, Lathrop Wells Gas Station, Furnace Creek and Stovepipe Wells did not show detectable levels of radioactivity.

Table 6. Analyses of air samples following the NRX-A2 EP-IV.

Location	Time-Date On Hrs PDT	Time-Date Off Hrs PDT	Volume (m^3)	Prefilter Gross Beta (pCi/m^3)		Gamma Pulse Ht. Analysis (pCi/m^3) ^{131}I	^{133}I	^{135}I
Lathrop Wells	0715,9-24	1455,9-24	261	450	P	13	57	84
					C	<1	42	37
	1500,9-24	0715,9-25	553	2.3	P			
					C	ND	<1	ND
Dansby Ranch	1050,9-24	1550,9-24	183	420	P	12	55	82
					C	<1	45	ND
Death Valley Junction	0940,9-24	1500,9-24	211	2.5	P			
					C	ND	ND	ND
	1500,9-24	0625,9-25	642	2.2	P			
					C	ND	<1	ND
Stovepipe Wells	1045,9-24	1500,9-24	181	<1	P			
					C	ND	ND	ND
	1510,9-24	1030,9-25	804	1.5	P	0.5	2.4	3.5
					C	<1	4.9	ND
Furnace Creek	1100,9-24	1500,9-24	146	3.6	P			
					C	ND	ND	ND
	1510,9-24	0955,9-25	750	19	P	0.5	2.4	3.5
					C	<1	3.9	ND

P - Prefilter
C - Charcoal cartridge
ND - Not detectable

Note: This table includes only those air samples containing fresh fission products. Results are corrected to the end of collection.

b. NRX-A2 EPV, October 15, 1964

On October 15, 1964, Experimental Plan V was conducted with low levels of radioactivity being detected northeast of

the test range complex. Due to the low exposure rates encountered by aerial monitors, no ground monitors were positioned off the test range complex. However, ground monitors located on the test range complex downwind from the reactor encountered no readings above background.

Only one off-site air sample contained detectable quantities of fresh fission products. The charcoal cartridge at Indian Springs showed 150 total picocuries of ^{131}I. This sample was started at 1800 on the test day and the air sampler motor failed during the night. However, if the sampler ran for only two hours, 150 total picocuries would be less than one picocurie per cubic meter on the filter. Although the effluent from EPV went to the northeast, it is believed that northerly drainage winds carried some radioactivity to the south during the night resulting in radioiodine being detected at Indian Springs.

Milk samples were collected at Lund, Nevada on October 16 and at Alamo and Hiko on October 20. These samples did not contain detectable quantities of fresh fission products. A water sample collected from a trough at Goss Ranch on October 16 contained 75 pCi/l of ^{133}I. No ^{131}I was detectable in the sample.

C. Six-months summary

The ten highest air filter results collected during the six-month period were taken following the previously summarized events and are listed in the tables of air sampling results.

Samples of water collected during this period from sources used for human consumption showed no fresh fission products. Approximately

170 samples from potable and nonpotable sources were collected during this time.

The only milk samples showing fresh fission products were collected subsequent to the Kiwi B4E and NRX-A2 reactor runs. All milk samples collected and analyzed from July through December 1964 are listed in the Appendix.

Approximately 2700 film badges were collected and processed from film badge stations and badged personnel in the off-site area. No exposures above the 30 mR detection limit were found that could be attributed to any one or combination of the events of this period.

V. CONCLUSIONS

Results obtained through environmental radiation surveillance during this period indicate that no individual in the off-site area received an exposure, resulting from Nevada Test Site operations, which exceeded the guides established by the AEC and/or recommended by the FRC and the NCRP.

APPENDIX I

ROUTINE MILK SAMPLING RESULTS

Note: ND on the following pages of tables means not detectable.

Appendix I

Routine Milk Sample Re ults

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	^{140}Ba-La	^{137}Cs	Ca	K
Alamo, Nevada								
Stewarts Dairy	07/01/64	ND	10.	ND	ND	70	1.15	1.6
Stewarts Dairy	08/20/64	ND	6.	ND	ND	55	1.22	1.2
Stewarts Dairy	08/22/64	No Chem.		ND	ND	55		1.3
Stewarts Dairy	10/14/64	ND	4.	ND	ND	45	1.11	1.5
Stewarts Dairy	12/01/64	ND	5.	ND	ND	35	1.09	1.7
Caliente, Nevada								
Young Ranch	08/12/64	ND	10.	ND	ND	25	1.18	1.4
Young Ranch	08/22/64	5	4.	ND	ND	25	1.20	1.4
Young Ranch	10/14/64	ND	6.	ND	ND	20	1.10	1.6
Young Ranch	11/12/64	ND	7.	ND	ND		1.03	1.9
Currant, Nevada								
Blue Eagle Ranch	07/20/64	5	12.	ND	ND	125	1.39	1.4
Blue Eagle Ranch	08/05/64	ND	11.	ND	ND	115	1.45	1.5
Blue Eagle Ranch	09/30/64	ND	10.	ND	ND	85	1.58	1.7
Blue Eagle Ranch	10/22/64	ND	24.	ND	ND	85	1.47	1.7
Blue Eagle Ranch	11/25/64	ND	19.	ND	ND	150	0.96	1.3
Duckwater, Nevada								
Halstead Ranch	09/30/64	ND	6.	ND	ND	65	1.15	1.7
Halstead Ranch	10/22/64	ND	13.	ND	ND	95	1.34	1.6
Halstead Ranch	11/24/64	ND	20.	ND	ND	120	1.06	1.3
Elgin, Nevada	08/22/64	No Chem.		ND	ND	20		1.0

Appendix I - continued

Routine Milk Sample Results (continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	$^{140}Ba\text{-}La$	^{137}Cs	Ca	K
Eureka, Nevada								
Fish Creek Ranch	07/21/64	ND	46.	ND	ND	175	1.48	1.2
Fish Creek Ranch	08/27/64	ND	31.	ND	ND	120	1.04	1.3
Fish Creek Ranch	09/30/64	ND	7.	ND	ND	75	.94	1.2
Fish Creek Ranch	10/22/64	ND	16.	ND	ND	90	1.18	1.5
Fish Creek Ranch	11/23/64	ND	17.	ND	ND	155	1.41	1.7
Hiko, Nevada								
Schofield Dairy	07/01/64	ND	5.	ND	ND	65	1.19	1.4
Schofield Dairy	08/11/64	ND	4.	ND	ND	40	1.28	1.2
Schofield Dairy	08/20/64	ND	4.	ND	ND	50	1.22	1.3
Schofield Dairy	08/22/64	No Chem.		ND	ND	45		1.3
Schofield Dairy	11/11/64	ND	8.	ND	ND	40	1.07	1.4
Schofield Dairy	12/01/64	ND	8.	ND	ND	60	1.31	1.4
Lathrop Wells, Nevada								
Dansby Ranch	12/07/64	No Chem.		ND	ND	30		
Dansby Ranch	12/09/64			ND	ND	15		
Selbach Ranch	12/07/64	No Chem.		ND	ND	30		
Selbach Ranch	12/10/64			ND	ND	30		
Las Vegas, Nevada								
Anderson Dairy	07/02/64	ND	8.	ND	ND	80	Sour	1.6
Anderson Dairy	08/11/64	ND	7.	ND	ND	55	1.15	1.4
Anderson Dairy	08/17/64	ND	9.	ND	ND	60	Sour	1.4
Anderson Dairy	09/01/64	ND	7.	ND	ND	30	1.12	1.3
Anderson Dairy	10/01/64	ND	9.	ND	ND	55	1.22	1.6
Anderson Dairy	10/13/64	ND	8.	ND	ND	15	1.19	1.7
Anderson Dairy	10/23/64	ND	6.	ND	ND	25	1.15	1.6
Anderson Dairy	11/04/64	ND	16.	ND	ND	60	1.20	1.8
Anderson Dairy	11/16/64	Sample lost.		ND	ND	50		1.5
Anderson Dairy	11/25/64	ND	11.	ND	ND	45	1.23	1.5

Routine Milk Sample Results (continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	$^{140}Ba\text{-}La$	^{137}Cs	Ca	K
Las Vegas, Nevada								
Arden Dairy	07/02/64	ND	8.	ND	ND	50	Sour	1.7
Arden Dairy	08/11/64	ND	3.	ND	ND	25	1.12	1.4
Arden Dairy	08/17/64	ND	5.	ND	ND	30	1.12	1.2
Arden Dairy	09/01/64	ND	4.	ND	ND	35	1.18	1.3
Arden Dairy	10/01/64	ND	9.	ND	ND	25	1.22	1.6
Arden Dairy	10/13/64	ND	5.	ND	ND	25	1.18	1.2
Arden Dairy	10/23/64	10	5.	ND	ND	35	1.18	1.5
Arden Dairy	11/04/64	ND	5.	ND	ND	10	1.20	1.8
Arden Dairy	11/16/64	ND	13.	ND	ND	25	1.20	1.6
Arden Dairy	11/25/64	ND	12.	ND	ND	30	1.22	1.7
Las Vegas, Nevada								
Bliss Dairy	07/02/64	ND	10.	ND	ND	70	1.17	1.5
Bliss Dairy	08/11/6	ND	6.	ND	ND	50	1.12	1.5
Bliss Dairy	08/17/64	ND	9.	ND	ND	60	1.18	1.2
Bliss Dairy	09/01/64	ND	8.	ND	ND	50	1.01	1.4
Bliss Dairy	10/01/64	30	8.	ND	ND	60	1.25	1.6
Bliss Dairy	10/13/64	ND	10.	ND	ND	50	1.17	1.3
Bliss Dairy	10/23/64	ND	6.	ND	ND	45	1.18	1.6
Bliss Dairy	11/04/64	ND	8.	ND	ND	30	1.22	1.4
Bliss Dairy	11/16/64	ND	7.	ND	ND	40	1.18	1.5
Bliss Dairy	11/25/64	ND	7.	ND	ND	20	1.23	1.3

Routine Milk Sample Results(continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	^{140}Ba-La	^{137}Cs	Ca	K
Las Vegas, Nevada								
Hiland Dairy	07/02/64	ND	9.	ND	ND	60	Sour	1.6
Hiland Dairy	08/11/64	ND	6.	ND	ND	50	1.10	1.4
Hiland Dairy	08/17/64	ND	5.	ND	ND	60	1.12	1.3
Hiland Dairy	09/01/64	ND	9.	ND	ND	55	1.22	1.3
Hiland Dairy	10/01/64	ND	14.	ND	ND	70	1.26	1.6
Hiland Dairy	10/13/64	ND	8.	ND	ND	50	1.20	1.6
Hiland Dairy	10/23/64	ND	7.	ND	ND	30	1.20	1.8
Hiland Dairy	11/04/64	ND	9.	ND	ND	40	1.23	1.5
Hiland Dairy	11/16/64	ND	11.	ND	ND	50	1.31	1.2
Hiland Dairy	11/25/64	ND	9.	ND	ND	60	1.27	1.5
Las Vegas, Nevada								
Hinies Dairy	07/02/64	ND	6.	ND	ND	50	Sour	1.7
Hinies Dairy	08/11/64	ND	5.	ND	ND	30	1.10	1.4
Hinies Dairy	08/17/64	Too sour				25		1.2
Hinies Dairy	09/01/64	ND	2.	ND	ND	25	1.04	1.4
Hinies Dairy	10/01/64	ND	4.	ND	ND	60	1.22	1.6
Hinies Dairy	10/13/64	ND	4.	ND	ND	25	1.18	1.5
Hinies Dairy	10/23/64	ND	8.	ND	ND	40	1.14	1.5
Hinies Dairy	11/04/64	ND	7.	ND	ND	35	1.18	1.0
Hinies Dairy	11/16/64	ND	9.	ND	ND	40	1.12	1.6
Hinies Dairy	11/25/64	ND	9.	ND	ND	50	1.23	1.4

Routine Milk Sample Results (continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	^{140}Ba-La	^{137}Cs	Ca	K
Las Vegas, Nevada								
Meadow Gold Dairy	07/02/64	ND	20.	ND	ND	110	Sour	1.5
Meadow Gold Dairy	08/11/64	ND	13.	ND	ND	75	1.18	1.3
Meadow Gold Dairy	08/17/64	Too sour.		ND	ND	75		1.3
Meadow Gold Dairy	09/01/64	ND	9.	ND	ND	65	1.06	1.1
Meadow Gold Dairy	10/01/64	ND	12.	ND	ND	30	1.29	1.4
Meadow Gold Dairy	10/13/64	ND	11.	ND	ND	65	1.23	1.5
Meadow Gold Dairy	10/23/64	ND	11.	ND	ND	60	1.23	1.5
Meadow Gold Dairy	11/04/64	ND	9.	ND	ND	60	1.28	1.6
Meadow Gold Dairy	11/16/64	ND	14.	ND	ND	65	1.28	1.3
Meadow Gold Dairy	11/25/64	ND	10.	ND	ND	55	1.24	1.6
Lida, Nevada								
Stevens Ranch	08/06/64	ND	18.	ND	ND	110	1.50	1.5
Stevens Ranch	09/29/64	ND	20.	ND	ND	90	1.38	1.4
Stevens Ranch	11/03/64	ND	7.	ND	ND	40	1.26	1.7
Lund, Nevada								
McKenzie Dairy	07/03/64	5	33.	ND	ND	320	1.16	1.6
McKenzie Dairy	07/09/64	ND	26.	ND	ND	265	1.10	1.5
McKenzie Dairy	07/16/64	5	25.	ND	ND	255	1.15	1.5
McKenzie Dairy	07/23/64	ND	14.	ND	ND	125	1.18	1.6
McKenzie Dairy	07/30/64	5	10.	ND	ND	115	1.14	1.3
McKenzie Dairy	08/06/64	ND	12.	ND	ND	110	1.17	1.3
McKenzie Dairy	08/13/64	5	8.	ND	ND	130	1.12	1.6
McKenzie Dairy	08/27/64	ND	11.	ND	ND	100	1.15	1.5
McKenzie Dairy	09/03/64	ND	9.	ND	ND	80	1.18	0.9
McKenzie Dairy	09/11/64	ND	7.	ND	ND	25	1.22	1.6

Routine Milk Sample Results (continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	^{140}Ba-La	^{137}Cs	Ca	K
Lund, Nevada (cont')								
McKenzie Dairy	09/17/64	ND	10.	ND	ND	100	1.20	2.0
McKenzie Dairy	09/26/64	ND	8.	ND	ND	55	1.19	1.6
McKenzie Dairy	10/02/64	ND	6.	ND	ND	ND	1.16	1.6
McKenzie Dairy	10/09/64	ND	9.	ND	ND	65	1.17	1.6
McKenzie Dairy	10/22/64	ND	7.	ND	ND	45	1.18	1.4
McKenzie Dairy	10/30/64	ND	8.	ND	ND	45	1.17	1.5
McKenzie Dairy	11/05/64	ND	10.	ND	ND	60	1.21	1.4
McKenzie Dairy	11/19/64	ND	10.	ND	ND	65	1.17	1.5
McKenzie Dairy	11/27/64	ND	10.	ND	ND	5	1.18	1.6
McKenzie Dairy	12/03/64	ND	8.	ND	ND	60	1.18	1.5
McKenzie Dairy	12/11/64	ND	8.	ND	ND	60	1.15	1.7
McKenzie Dairy	12/18/64	ND	7.	ND	ND	50	1.10	1.4
McKenzie Dairy	12/26/64	ND	10.	ND	ND	65	1.15	1.5
McKenzie Dairy	12/31/64	ND	9.	ND	ND	75	1.18	1.4
Manhattan, Nevada								
Peavine Ranch	07/02/64	ND	7.	ND	ND	60	1.18	1.7
Peavine Ranch	07/30/64	ND	5.	ND	ND	55	1.03	1.1
Peavine Ranch	09/04/64	ND	8.	ND	ND	80		1.5
Peavine Ranch	09/30/64	ND	5.	ND	ND	55	1.17	1.7
Peavine Ranch	11/05/64	Sample lost.		ND	ND	150		1.9
Peavine Ranch	12/03/64	ND	4.	ND	ND	35	1.23	1.2
Moapa, Nevada								
Searles Dairy	07/01/64	ND	6.	ND	ND	40	1.12	1.4
Searles Dairy	08/11/64	5	5.	ND	ND	55	1.14	1.5
Searles Dairy	08/20/64	ND	8.	ND	ND	55	1.18	1.5
Searles Dairy	09/09/64	ND	7.	ND	ND	65	1.12	1.7
Searles Dairy	10/14/64	ND	8.	ND	ND	15	1.18	1.6
Searles Dairy	12/01/64	ND	15.	ND	ND	60	.70	1.5
Searles Dairy	12/30/64	ND	8.	ND	ND	50	1.15	1.5

Routine Milk Sample Results (continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	$^{140}Ba\text{-}La$	^{137}Cs	Ca	K
Nyala, Nevada								
Sharp Ranch	10/07/64	ND	15.	ND	ND	180	1.22	1.3
Pahrump, Nevada								
Anderson Ranch	07/30/64	ND	2.	ND	ND	25	1.31	1.3
Anderson Ranch	08/22/64	No Chem.		ND	ND	30		1.3
Anderson Ranch	10/01/64	ND	1.	ND	ND	20	1.23	1.6
Anderson Ranch	10/29/64	ND	1.	ND	ND	ND	1.25	1.8
Anderson Ranch	11/06/64	5	4.	ND	ND	40	1.20	1.6
Anderson Ranch	12/02/64	ND	29.	ND	ND	155	1.38	1.4
Pioche, Nevada								
Horlachers Ranch	07/01/64	ND	15.	ND	ND	85	1.47	1.0
Horlachers Ranch	08/26/64	ND	12.	ND	ND	35	Sour	1.1
Horlachers Ranch	10/14/64	ND	15.	ND	ND	55	1.07	1.6
Horlachers Ranch	11/11/64	ND	28.	ND	ND	60	1.55	1.6
Springdale, Nevada								
Peacock Ranch	07/30/64	ND	3.	ND	ND	65	1.40	1.3
Twin Springs, Nevada								
Twin Springs Ranch	10/07/64	ND	4.	ND	ND	55	1.12	1.9
Joseph City, Arizona	11/05/64	ND	9.	ND	ND	10	1.20	1.8
Logansville, Arizona	08/20/64	ND	5.	ND	ND	ND	1.25	1.7
Somerton, Arizona	12/11/64	No Chem.		ND	ND	25		
" "	12/11/64			ND	ND	15		
Taylor, Arizona	11/05/64	ND	9.	ND	ND	45	1.16	1.4

Routine Milk Sample Results (continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	^{140}Ba-La	^{137}Cs	Ca	K
Tucson, Arizona	11/04/64	ND	1.	ND	ND	35	1.17	1.3
" "	11/04/64	ND	4.	ND	ND	25	1.46	1.4
Blackfoot, Idaho	09/15/64	5	10.	ND	ND	60	1.18	1.6
Boise, Idaho	09/15/64	ND	22.	ND	ND	160	1.31	1.6
Buhl, Idaho	09/15/64	5	22.	ND	ND	165	1.20	1.4
Burley, Idaho	09/15/64	ND	28.	ND	ND	145	1.31	1.7
Coeur d'Alene, Idaho	09/15/64	ND	39.	ND	ND	165	.93	0.9
Idaho Falls, Idaho	09/14/64	ND	14.	ND	ND	110	1.03	1.2
Jerome, Idaho	09/15/64	ND	14.	ND	ND	75	1.20	1.8
Lewiston, Idaho	09/14/64	5	17.	ND	ND	60	1.26	1.4
Mountain Home, Idaho	09/15/64	ND	24.	ND	ND	160	1.33	1.3
Pocatello, Idaho	09/15/64	ND	17.	ND	ND	90	1.20	1.6
" "	09/16/64	ND	14.	ND	ND	55	1.20	1.6
" "	09/17/64	ND	16.	ND	ND	90	1.25	1.7
" "	09/18/64	ND	16.	ND	ND	85	1.23	1.6
Garrison, Utah								
Gonders Ranch	08/03/64	ND	9.	ND	ND	60	1.11	1.3
Gonders Ranch	08/25/64	ND	8.	ND	ND	65	1.12	1.3
Gonders Ranch	09/29/64	ND	4.	ND	ND	30	1.24	1.1
Gonders Ranch	10/21/64	ND	12.	ND	ND	20	.98	1.5
Gonders Ranch	11/24/64	ND	10.	ND	ND	55	1.57	1.5

Routine Milk Sample Results (continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	^{140}Ba-La	^{137}Cs	Ca	K
Newcastle, Utah								
Newcastle Dairy	07/14/64	ND	12.	ND	ND	70	1.17	1.5
Newcastle Dairy	09/07/64	ND	11.	ND	ND	65	1.23	1.5
Newcastle Dairy	10/14/64	ND	9.	ND	ND	40	1.22	1.5
Newcastle Dairy	11/22/64	5	4.	ND	ND	20	1.20	1.3
St. George, Utah								
R. Cox	07/03/64	ND	9.	ND	ND	60	1.08	1.5
R. Cox	07/10/64	ND	10.	ND	ND	50	1.14	1.4
R. Cox	07/17/64	ND	10.	ND	ND	50	1.10	1.4
R. Cox	07/24/64	ND	9.	ND	ND	45	1.20	1.2
R. Cox	07/31/64	ND	9.	ND	ND	55	1.12	1.2
R. Cox	08/07/64	ND	11.	ND	ND	50	1.20	1.3
R. Cox	08/14/64	ND	8.	ND	ND	55	1.20	1.3
R. Cox	08/20/64	ND	8.	ND	ND	ND	1.20	1.5
R. Cox	08/21/64	ND	8.	ND	ND	10	1.23	1.3
R. Cox	08/28/64	ND	7.	ND	ND	65	1.12	1.6
R. Cox	09/04/64	ND	25.	ND	ND	35	1.17	1.3
R. Cox	09/11/64	ND	5.	ND	ND	120	1.18	1.4
R. Cox	09/17/64	ND	7.	ND	ND	40	1.17	1.6
R. Cox	09/24/64	ND	6.	ND	ND	60	1.18	1.6
R. Cox	10/02/64	ND	7.	ND	ND	60	1.17	1.2
R. Cox	10/09/64	ND	9.	ND	ND	55	1.18	1.5
R. Cox	10/16/64	ND	5.	ND	ND	35	1.14	1.4
R. Cox	10/22/64	ND	7.	ND	ND	30	1.14	1.6
R. Cox	10/30/64	ND	5.	ND	ND	40	1.14	1.3

Routine Milk Sample Results(continued)

COLLECTION DATA		ANALYTICAL DATA						
		Activity (pCi/l)					Concentration (gm/l)	
Location	Date	^{89}Sr	^{90}Sr	^{131}I	$^{140}Ba\text{-}La$	^{137}Cs	Ca	K
St. George, Utah(cont')								
R. Cox	11/05/64	5	4.	ND	ND	40	1.20	1.6
R. Cox	11/13/64	ND	6.	ND	ND	35	1.14	1.4
R. Cox	11/20/64	ND	8.	ND	ND	50	1.14	1.5
R. Cox	11/27/64	ND	20.	ND	ND	30	1.09	1.4
R. Cox	12/04/64	ND	7.	ND	ND	65	1.17	1.4
R. Cox	12/11/64	ND	7.	ND	ND	45	1.18	1.4
R. Cox	12/18/64	ND	10.	ND	ND	45	1.01	1.6

APPENDIX II

SPECIAL MILK SAMPLING RESULTS

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Appendix II

Parrot Event Milk Sample Results

COLLECTION DATA		ANALYTICAL DATA					
		Activity (pCi/l)					Concentration (gm/l)
Location	Date Collected	^{89}Sr	^{90}Sr	^{131}I	^{133}I	^{137}Cs	Ca
Alamo, Nevada							
Stewart	12/19/64	ND	2	ND	ND	20	1.22
Stewart	12/23/64	ND	3	ND	ND	20	
Caliente, Nevada							
Young	12/19/64	ND	6	ND	ND	30	1.17
Young	12/23/64	ND	4	ND	ND	45	
Hiko, Nevada							
Schofield	12/19/64	ND	12	ND	ND	55	
Moapa, Nevada							
Perkins Ranch	12/19/64	ND	1	ND	ND	10	1.19
Nyala, Nevada							
M. Sharp	12/18/64	10	16	ND	ND	130	1.40
Pioche, Nevada							
Horlachers	12/22/64	ND	4	ND	ND	45	1.15

ND = Not detectable

Appendix II (continued)
Milk results of the Sulky Event.

Location	Date Collected	Date Counted	Activity pCi/l		
			^{131}I	^{133}I	^{137}Cs
Duckwater, Nevada Halstead Ranch	12/19/64	12/20/64	ND	ND	90
Nyala, Nevada Sharp's Ranch	12/19/64	12/20/64	ND	ND	140
Nyala, Nevada Sharp's Ranch	12/23/64	12/23/64	ND	ND	50

ND = Not detectable

Appendix II (continued)

Milk Sample Results for Kiwi B4E EP-V

COLLECTION DATA		ANALYTICAL DATA		
Location	Date Collected	Activity (pCi/l)		
		^{131}I	^{133}I	^{137}Cs
Nyala, Nevada				
M. Sharp Ranch	8/29/64	ND	ND	25
M. Sharp Ranch	8/30/64	ND	ND	100
M. Sharp Ranch	8/31/64	ND	ND	70
M. Sharp Ranch	9/01/64	ND	ND	70
Currant, Nevada				
Blue Eagle Ranch	8/29/64	ND	ND	65
Blue Eagle Ranch	8/29/64	ND	ND	70
Blue Eagle Ranch	8/31/64	ND	ND	80
Blue Eagle Ranch	9/01/64	ND	ND	100
Blue Eagle Ranch	9/02/64	ND	ND	90
Manzonie Ranch	9/01/64	ND	ND	50
Manzonie Ranch	9/02/64	ND	ND	60
Duckwater, Nevada				
Halstead Ranch	9/02/64	ND	ND	65
Sunnyside, Nevada				
Hendrick Ranch	8/30/64	ND	ND	90
Hendrick Ranch	8/31/64	ND	ND	95
Hendrick Ranch	9/02/64	ND	ND	75
Lund, Nevada				
McKenzie Dairy	8/29/64	ND	ND	95
McKenzie Dairy	8/30/64	ND	ND	85
McKenzie Dairy	8/31/64	ND	ND	80
McKenzie Dairy	9/01/64	ND	ND	100

ND = Not detectable

Appendix II (continued)

Milk Sample Results for Kiwi B4E EP-V (continued)

COLLECTION DATA		ANALYTICAL DATA		
Location	Date Collected	Activity (pCi/l)		
		^{131}I	^{133}I	^{137}Cs
Ely, Nevada				
Georgetown Ranch	8/30/64	ND	ND	45
Georgetown Ranch	8/31/64	ND	ND	45
Georgetown Ranch	9/02/64	ND	ND	50
Cherry Creek, Nevada				
Henroid Ranch	9/02/64	ND	ND	90
Ely, Nevada				
Yelland Ranch	8/29/64	ND	ND	115
Yelland Ranch	8/30/64	ND	ND	85
Yelland Ranch	8/31/64	ND	ND	110
Yelland Ranch	9/01/64	ND	ND	130
Eldridge Ranch	9/02/64	ND	ND	150
Shoshone, Nevada				
Kirkeby Ranch	8/29/64	ND	ND	70
Kirkeby Ranch	8/30/64	ND	ND	25
Kirkeby Ranch	8/31/64	ND	ND	20
Kirkeby Ranch	9/01/64	ND	ND	30
Kirkeby Ranch	9/02/64	ND	ND	10
Ursine, Nevada				
Donahue Ranch	8/30/64	20	ND	40
Donahue Ranch	8/31/64	ND	ND	40
Donahue Ranch	9/01/64	ND	ND	60
Donahue Ranch	9/02/64	ND	ND	55
Lytle Ranch	8/29/64	ND	ND	25
Lytle Ranch	8/30/64	ND	ND	20
Lytle Ranch	9/01/64	ND	ND	60

ND = Not detectable

Appendix II (continued)

Milk Sample Results for Kiwi B4E EP-V (continued)

COLLECTION DATA		ANALYTICAL DATA		
Location	Date Collected	Activity (pCi/l)		
		^{131}I	^{133}I	^{137}Cs
Pioche, Nevada				
Horiacher Ranch	8/29/64	ND	ND	55
Horlacher Ranch	8/30/64	ND	ND	60
Horlacher Ranch	8/31/64	ND	ND	65
Horlacher Ranch	9/01/64	ND	ND	80
Panaca, Nevada				
Lee Ranch	9/01/64	ND	ND	60
Lee Ranch	9/02/64	ND	ND	65
Caliente, Nevada				
Young Ranch	8/29/64	ND	ND	30
Young Ranch	8/30/64	ND	ND	20
Young Ranch	8/31/64	ND	ND	20
Young Ranch	9/01/64	ND	ND	20
Young Ranch	9/02/64	ND	ND	30
Elgin, Nevada				
Bradshaw Ranch	9/01/64	ND	ND	60
Hiko, Nevada				
Schofield Dairy	8/29/64	ND	ND	45
Schofield Dairy	8/30/64	ND	ND	40
Schofield Dairy	8/31/64	ND	ND	40
Schofield Dairy	9/01/64	ND	ND	40
Schofield Dairy	9/02/64	ND	ND	40
Alamo, Nevada				
Stewart Dairy	8/29/64	ND	ND	40
Stewart Dairy	8/30/64	ND	ND	40
Stewart Dairy	8/31/64	ND	ND	40
Stewart Dairy	9/01/64	ND	ND	65
Stewart Dairy	9/02/64	ND	ND	50

ND = Not detectable

Appendix II (continued)

Milk Sample Results for Kiwi B4E EP-V (continued)

COLLECTION DATA		ANALYTICAL DATA		
Location	Date Collected	Activity (pCi/l)		
		^{131}I	^{133}I	^{137}Cs
Cedar City, Utah				
College of So. Utah	8/31/64	ND	ND	65
Beaver, Utah				
Roberts Ranch	8/31/64	ND	ND	60
Roberts Ranch	9/01/64	ND	ND	55
Roberts Ranch	9/02/64	ND	ND	35
Carter Ranch	8/31/64	ND	ND	45
Milford, Utah				
Goodwin Ranch	8/30/64	ND	ND	ND
Goodwin Ranch	8/31/64	ND	ND	25
Goodwin Ranch	9/01/64	ND	ND	25
Goodwin Ranch	9/02/64	ND	ND	30
Fillmore, Utah				
Utley Ranch	8/29/64	ND	ND	25
Utley Ranch	8/30/64	ND	ND	40
Utley Ranch	8/31/64	ND	ND	65
Delta, Utah				
Anderson Ranch	8/29/64	ND	ND	95
Anderson Ranch	8/30/64	ND	ND	110
Anderson Ranch	8/31/64	ND	ND	115
Anderson Ranch	9/02/64	ND	ND	50
Garrison, Utah				
Gonder Ranch	8/29/64	ND	ND	40
Gonder Ranch	8/30/64	ND	ND	55
Gonder Ranch	8/31/64	ND	ND	45
Gonder Ranch	9/01/64	ND	ND	55
Gonder Ranch	9/02/64	ND	ND	45

ND = Not detectable

Appendix II (continued)

Milk Sample Results for Kiwi B4E EP-V (continued)

COLLECTION DATA		ANALYTICAL DATA		
Location	Date Collected	Activity (pCi/l)		
		^{131}I	^{133}I	^{137}Cs
Casper, Wyoming				
Meadow Gold Dairy	8/31/64	ND	ND	50
Meadow Gold Dairy	9/01/64	ND	ND	80
Cheyenne, Wyoming				
Dairy Gold	8/30/64	ND	ND	90
Dairy Gold	8/31/64	ND	ND	60
Plains Dairy	8/30/64	ND	ND	60
Plains Dairy	8/31/64	ND	ND	80
Lyman, Wyoming				
Federated Farm	8/30/64	ND	ND	60
Federated Farm	8/30/64	ND	ND	60
Powell, Wyoming				
Cream O Valley Dairy	8/31/64	ND	ND	90
Cream O Valley Dairy	9/01/64	ND	ND	80
Riverton, Wyoming				
Morning Star Dairy	8/31/64	ND	ND	70
Eden Valley, Wyoming				
Federated Farm	8/31/64	ND	ND	75
Sheridan, Wyoming				
Jersey Creamery	8/30/64	ND	ND	100
Sheridan County Dairy	8/31/64	ND	ND	105

ND = Not detectable

Appendix II (continued)
Milk Sample Results for Kiwi B4E EP-VI

COLLECTION DATA		ANALYTICAL DATA		
Location	Date Collected	Activity (pCi/l)		
		^{131}I	^{133}I	^{137}Cs
Hiko, Nevada				
Schofield Dairy	9/12/64	30	ND	40
Schofield Dairy	9/13/64	40	ND	35
Schofield Dairy	9/15/64	ND	ND	ND
Schofield Dairy	9/17/64	ND	ND	ND
Schofield Dairy	9/23/64	ND	ND	ND
Alamo, Nevada				
Stewart Dairy	9/11/64	ND	ND	35
Stewart Dairy	9/12/64	ND	ND	30
Stewart Dairy	9/13/64	ND	ND	35
Stewart Dairy	9/15/64	ND	ND	85
Pioche, Nevada				
Horlacher Ranch	9/11/64	ND	ND	70
Horlacher Ranch	9/12/64	ND	ND	70
Horlacher Ranch	9/13/64	ND	ND	55
Caliente, Nevada				
Young Ranch	9/11/64	ND	ND	10
Young Ranch	9/12/64	ND	ND	20
Young Ranch	9/13/64	ND	ND	20
Ursine, Nevada				
Lytle Ranch	9/12/64	ND	ND	30
Lytle Ranch	9/13/64	ND	ND	15

ND = Not detectable

Appendix II (continued)
NRX-A2 Milk Sample Results

COLLECTION DATA		ANALYTICAL DATA		
Location	Date Collected	Activity (pCi/l)		
		^{131}I	^{133}I	^{137}Cs
Barstow, California				
Hills Dairy	9/27/64	ND	ND	20
Cantil, California				
M/R Cattle Co.	9/27/64	ND	ND	40
Lone Pine, California				
Lone Pine Dairy	9/26/64	ND	ND	40
Olancha, California				
Hunters Ranch	9/26/64	ND	ND	65
Lathrop Wells, Nevada				
Dansby Ranch	9/24/64	ND	200	20
Dansby Ranch	9/25/64	ND	70	30
Dansby Ranch	9/26/64	ND	20	20
Dansby Ranch	9/27/64	ND	ND	25
Dansby Ranch	9/29/64	ND	ND	15
Alamo, Nevada				
Stewart Dairy	10/20/64	ND	ND	45
Hiko, Nevada				
Schofield Dairy	10/20/64	ND	ND	10
Lund, Nevada				
McKenzie Dairy	10/16/64	ND	ND	35

ND = Not detectable